

Office Action Summary	Application No. 10/534,495	Applicant(s) LEWIN ET AL.	
	Examiner ROY PUNNOOSE	Art Unit 2886	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 June 2009 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|--|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. <u>6/4/2010</u> . |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____. | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Withdrawal of Finality

1. Applicant's request for reconsideration of the finality of the rejection of the last Office action is persuasive and, therefore, the finality of that action is withdrawn. A rejection based on new prior art relevant to the applicant's claimed invention has been discovered, and is the subject of this office action.

Interview

2. In the interest of compact prosecution, the Examiner contacted and had an interview with Atty. Stanley Spooner on 04 June 2010. The Examiner proposed an in-person interview at the Office in the presence of the Examiner's supervisor, Tarifur Chowdhury, to discuss the claims, possible allowable subject matter and/or any other pending issues. However, Atty. Spooner declined the offer and stated that "an in-person interview at the Office would not be feasible because his clients are in the UK." Atty. Spooner stated that he's willing to correct any errors via a telephone interview.

Response to Amendment and Arguments

3. Applicant's amendment filed on 06/16/2009 is acknowledged. The applicant has amended claims 1, 5, 13-15, 20-21 and 27 in response to the office action of 02/09/2009. Claims 1-37 are pending in the application.

4. Furthermore, it is noted that the applicant has filed amendments to the specification and the drawings in response to the objections stated the previous office action. The Examiner has accepted the applicant's amendments of the specification and the drawings.

5. Furthermore, it is noted that the applicant has **elected not** to comply with the PCT format requirements, despite repeated indication of format deficiencies in previous office actions. The

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PCT format requirements, specifically about the *Description/Specification*, and the *headings*, were detailed in the last office action, and are shown again below as it appears in **MPEP 1823** for applicant's convenience.

1823 [R-5] The Description

PCT Article 5.

The Description

The description shall disclose the invention in a manner sufficiently clear and complete for the invention to be carried out by a person skilled in the art.

PCT Rule 5.

The Description

5.1..

Manner of the Description

- (a) The description shall first state the title of the invention as appearing in the request and shall:
- (i) specify the technical field to which the invention relates;

*PCT Rule 5.
The Description*

5.1..

Manner of the Description

- (a) The description shall first state the title of the invention as appearing in the request and shall:
- (i) specify the technical field to which the invention relates;
 - (ii) indicate the background art which, as far as known to the applicant, can be regarded as useful for the understanding, searching and examination of the invention, and, preferably, cite the documents reflecting such art;
 - (iii) disclose the invention, as claimed, in such terms that the technical problem (even if not expressly stated as such) and its solution can be understood, and state the advantageous effects, if any, of the invention with reference to the background art;
 - (iv) briefly describe the figures in the drawings, if any;
 - (v) set forth at least the best mode contemplated by the applicant for carrying out the invention claimed; this shall be done in terms of examples, where appropriate, and with reference to the drawings, if any; where the national law of the designated State does not require the description of the best mode but is satisfied with the description of any mode (whether it is the best contemplated or not), failure to describe the best mode contemplated shall have no effect in that State;
 - (vi) indicate explicitly, when it is not obvious from the description or nature of the invention, the way in which the invention is capable of exploitation in industry and the way in which it can be made and used, or, if it can only be used, the way in which it can be used; the term "industry" is to be understood in its broadest sense as in the Paris Convention for the Protection of Industrial Property.
- (b) The manner and order specified in paragraph (a) shall be followed except when, because of the nature of the invention, a different manner or a different order would result in a better understanding and a more economic presentation.
- (c) Subject to the provisions of paragraph (b), each of the parts referred to in paragraph (a) shall preferably be preceded by an appropriate heading as suggested in the Administrative Instructions.

PCT Administrative Instructions 204.

Headings of the Parts of the Description

The headings of the parts of the description should be as follows:

- (i) for matter referred to in Rule 5.1(a)(i), "Technical Field";
- (ii) for matter referred to in Rule 5.1(a)(ii), "Background Art";
- (iii) for matter referred to in Rule 5.1(a)(iii), "Disclosure of Invention";
- (iv) for matter referred to in Rule 5.1(a)(iv), "Brief Description of Drawings";
- (v) for matter referred to in Rule 5.1(a)(v), "Best Mode for Carrying Out the Invention," or, where appropriate, "Mode(s) for Carrying Out the Invention";
- (vi) for matter referred to in Rule 5.1(a)(vi), "Industrial Applicability";

6. With regard to the objection of claim 13 as detailed in the previous office action, the Examiner has accepted applicant's amendment of claim 13 to correct the deficiencies.

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7. With regard to the 35 USC 112 rejections of the previous office action, the Examiner has accepted all of applicant's amendments of the claims to correct the deficiencies.

8. On page 17 of papers filed on 06/16/2009, the applicant has presented the following argument:

Claims 1-3, 6, 9, 16-18 and 21-23 stand rejected under 35 USC §102(b) as anticipated by Kuchitsu (JP 62007019). The Court of Appeals for the Federal Circuit has noted in the case of *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick*, 221 USPQ 481, 485 (Fed. Cir. 1984) that "[a]nticipation requires the presence in a single prior art reference disclosure of each and every element of the claimed invention, arranged as in the claim."

In order to determine whether a prior art reference has all elements and all interrelationships between elements specified in the claim, the Examiner must first properly construe the claim. Each of Applicants' claims recite a "structured light" generator for illuminating a scene. Applicants have amended claim 1 to further recite that the structured light generator is "such that light reflected from the scene can be imaged to provide range information" as further explanation for how and what the structured light generator is useful for. However, the fact remains that Applicants' invention is a particular type of "structured light" generator and the Examiner must construe the claim properly, i.e., it is limited to structured light generators.

The applicant's amended claim 1 is as follows:

1. (currently amended) A structured light generator for illuminating a scene such that light reflected from the scene can be imaged to provide range information, said structured light generator comprising:

a light source arranged to illuminate part of the input face of a light guide,

the light guide comprising a tube having substantially reflective sides; and

projection optics arranged together with said light source and said light guide so as to

project a regular array of distinct image spots of the light source towards the scene.

Claim 1 essentially comprises of three components:

- a) **A light guide** (comprising a tube with reflective sides);
- b) **A light source** (arranged to illuminate part of the input face of the light guide);
and,
- c) **Projection optics** (for projecting an array of spots of the light source towards a scene).

Prior art KUCHITSU (JP 62007019 A) teaches of a structured light generator (**see Fig.1**) for illuminating a scene **5** comprising;

- a) **A light guide 1a** (see Figures 1 and 2);
- b) **A light source 3, 6** arranged to illuminate part of the input face of a light guide **1a**, the light guide **1a** comprising a tube having substantially reflective sides; and,
- c) **Projection optics 4** arranged together with said light source **3, 6** and said light guide **1a** so as to project a regular array of distinct spots (**see Fig.3**) of the light source **3, 6** towards the scene **5** (**see abstract**).

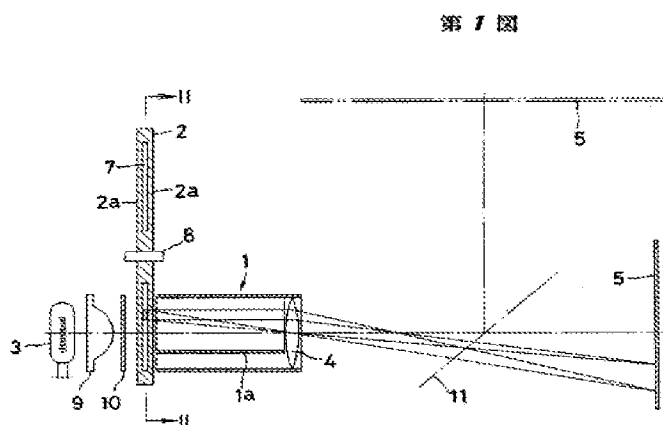


Figure 1. Structured light generating apparatus (JP 62007019 A)

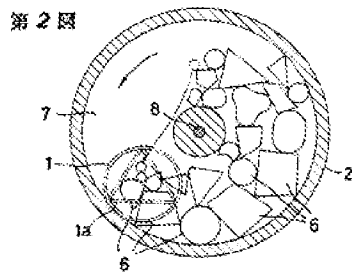


Figure 2. Structured light generating apparatus (JP 62007019 A)

9. In paragraph [0008] of U.S. Patent Application Publication (120US 2006/0146560 A1) of the instant application, the applicant defines **structured light generator** in the following manner:

“As used in this specification the term structured light generator shall be taken to mean a source which projects a plurality of distinct areas of light towards a scene.”

However, the applicant has not provided a definition for “structured light.” In view of the lack of definition for “structured light”, for examination purposes, “structured light” has been given the most generic meaning and the broadest reasonable interpretation.

For examination purposes, any light that has a structure, meaning some sort of order, and not having a random direction or pattern, has been considered as “structured light.”

Prior art Kuchitsu clearly shows in Figure 3 a regular light pattern that is symmetrical and therefore having an order, projected on a screen/scene.

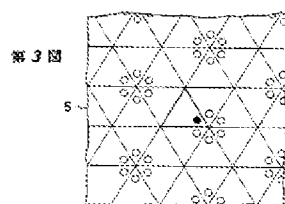


Figure 3. Array of distinct images (JP 62007019 A)

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10. On page 18 of papers filed on 06/16/2009, the applicant argues that wikipedia definition of “structured light” is consistent with the term as used in the specification and claims of the present application.

Since the applicant has not provided a definition for “structured light” in the specification a **most generic meaning and the broadest reasonable interpretation** has been used for the examination of the instant application. An interpretation that is not limited to the wikipedia definition has been used for the examination of the instant application.

For examination purposes, any light that has a structure, meaning some sort of order (such as symmetry), and not having a random direction or pattern, has been considered as “structured light.”

In view of the above reasoning, and for the lack of definition in the specification for “structured light”, applicant's argument that the applicant’s invention is a particular type of “structured light” has not been given any weight for examination purposes.

11. On page 18 of papers filed on 06/16/2009, the applicant has presented the following argument:

Finally and most importantly, Applicants’ specification includes a definition of structured light generator, i.e., “as used in this specification the term structured light generator shall be taken to mean a source which projects a plurality of distinct areas of light towards a scene.” (Specification, page 2, lines 10-12). This definition is consistent with the Wikipedia definition of structured light as “projecting a known pattern of pixels (often grids or horizontal bars) on to scene.” Thus, the term “structured light generator” as claim terminology clearly serves to limit the claim and in this instance limits the manner in which the components are combined. Thus, under PTO practice, this preamble limitation must be considered by the Examiner when considering prior art.

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Kuchitsu teaches the use of light emitting diode (LED) as source of light. LEDs are known in the art as point light sources. When an LED or a point light source is used as a light source on the input side of the light guide, it projects a plurality of distinct areas of light towards a scene. This is the principle of a kaleidoscope which is known in prior art. Furthermore, the applicant states in paragraph [0010], line 1, of U.S. Patent Application Publication (US 2006/0146560 A1) of the instant application that “the lightguide in effect operates as a kaleidoscope.”

The recitation “such that light reflected from the scene can be imaged to provide range information” has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). See MPEP 707.07 (f).

12. On page 18 of papers filed on 06/16/2009, the applicant has presented the following argument:

Turning to the Kuchitsu reference, there is no disclosure of any structured light generator in the Kuchitsu reference. Instead, Kuchitsu describes a device for outputting a complex and constantly changing pattern for use in the entertainment field of signs and games. The device produces an output of moving patterns (the direct opposite of a “structured light” generator) and one of ordinary skill in the art reviewing Kuchitsu will appreciate that these patterns vary randomly with time. In fact, the Kuchitsu reference at numerous instances specifies that the patterns are “extremely rich in changes.”

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The Examiner agrees that Kuchitsu's apparatus outputs a constantly changing pattern. Nevertheless, **it outputs a structured light pattern**. Kuchitsu teaches the use of light emitting diode (LED) as source of light. LEDs are known in the art as point light sources. When an LED or a point light source is used as a light source on the input side of the lightguide, it projects a plurality of distinct areas of light towards a scene. This is the principle of a kaleidoscope which is known in prior art. Furthermore, the applicant states in paragraph [0010], line 1, of U.S. Patent Application Publication (US 2006/0146560 A1) of the instant application that "the lightguide in effect operates as a kaleidoscope."

13. On page 19 of papers filed on 06/16/2009, the applicant has presented the following argument:

The patterns in Kuchitsu are not "known" and are continuously changing in an unpredictable manner. Therefore, Kuchitsu teaches an unstructured light generator which would be the direct opposite of the claimed structured light generator. Accordingly, Kuchitsu clearly leads those of ordinary skill in the art away from the claimed invention. Thus, the Examiner is incorrect in his analysis of the present independent claims in his suggestion that Kuchitsu in Figure 1 illustrates a structured light generator because Kuchitsu actually leads one of ordinary skill in the art away from the claimed combination of elements.

The Examiner respectfully disagrees with the applicant's argument that Kuchitsu teaches "an unstructured light generator." The Examiner finds that the Kuchitsu apparatus comprises the three components claimed in the applicant's invention, namely (a) a light source, (b) a tubular lightguide with reflective sides, and (c) projection optics, arranged in the same manner as claimed by the applicant. What Kuchitsu's apparatus has in addition to the applicant's claimed invention is a motor to rotate the assembly **for modulating the light incident on the input face of the light guide**. Absent the motor, Kuchitsu teaches all the structural limitations

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claimed by the applicant in claim 1. The Examiner agrees that Kuchitsu's apparatus outputs a constantly changing pattern. Nevertheless, it outputs **a structured light pattern**. Kuchitsu teaches the use of light emitting diode (LED) as source of light. LEDs are known in the art as point light sources. When an LED or a point light source is used as a light source on the input side of the lightguide, it projects a plurality of distinct areas of light towards a scene. This is the principle of a kaleidoscope which is known in prior art. Furthermore, the applicant states in paragraph [0010], line 1, of U.S. Patent Application Publication (US 2006/0146560 A1) of the instant application that "the lightguide in effect operates as a kaleidoscope." In view of the above reasoning, the applicant's argument that Kuchitsu teaches an **unstructured light generator** is incorrect and therefore has not been accepted.

14. On page 19 of papers filed on 06/16/2009, the applicant essentially argues that because Kuchitsu does not teach a structured light generator, claims 1-3, 6, 9, 16-18 and 21-23 cannot be anticipated. The Examiner respectfully disagrees with the applicant's assertion that Kuchitsu does not teach a structured light generator. Kuchitsu clearly teaches a structured light generator. Please see paragraphs above for details on Kuchitsu's teaching of a structured light generator.

15. On pages 19-23 of papers filed on 06/16/2009, the applicant essentially argues that because Kuchitsu does not teach a structured light generator, claims 4-5, 7, 10-15, 19-20, and 24-37 can neither be anticipated nor are obvious over other prior art teachings because Kuchitsu does not teach a structured light generator as claimed by independent claim, claim 1, and therefore claims 4-5, 7, 10-15, 19-20, and 24-37 being dependent on claim 1, fails to teach a structured light generator as claimed in the instant application. The Examiner respectfully disagrees with the applicant's assertion that Kuchitsu does not teach a structured light generator.

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Kuchitsu clearly teaches a **structured light generator** as detailed in the paragraphs above and in the reasons for rejections below.

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

18. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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19. Definitions:

Because the specification lacks definitions for “**structured light**” and “**regular array**”, for examination purposes they have been given most generic meaning and the broadest interpretation.

Structured light: For examination purposes, any light that has a structure, meaning some sort of order (such as symmetry), and not having a random pattern, has been considered as “structured light.”

Regular array: any repeating pattern (of light) has been accepted as a “regular array” for examination purposes.

20. Applicant’s claimed invention:

The applicant’s claimed invention, at least as claimed in claim 1, is a **kaleidoscopic projector**, which the applicant calls a **structured light projector**, comprising:

- a) **A light guide** (comprising a tube with reflective sides);
 - b) **A light source** (arranged to illuminate part of the input face of the light guide);
and,
 - c) **Projection optics** (for projecting an array of spots of the light source towards a scene).
21. Kaleidoscope principles teach that in a **kaleidoscopic projector**, when a light source or an illuminated object or an image is placed or positioned at the input face of the light guide having reflective sides, it results in the projection of a symmetrical pattern toward a scene, wherein the shape of the projected pattern has a direct correspondence to the shape of the light source or illuminated object that is placed at the input face of the light guide.

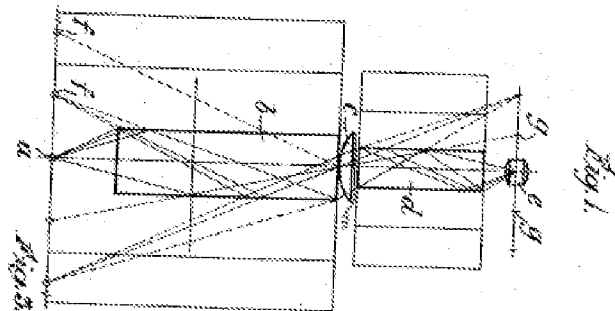
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In Kuchitsu's apparatus, the pattern incident on the input face creates a corresponding pattern on the screen/scene. **Kuchitsu changes the pattern incident on the input face in quick or seamless succession resulting in a corresponding change in the pattern that is projected on the screen.** From Kuchitsu's teaching it would have been obvious to a person having ordinary skill in the art that when different patterns are placed on the input face of the light guide, it would result in a correspondingly different patterns projected on the screen/scene.

22. **Note:** An English translation of the Kuchitsu document is provided for applicant's convenience. All reference made in this office action refers to this English translation of the Kuchitsu document and its pages.

23. Prior art Kuchitsu (JP 62007019 A) teaches of such a kaleidoscopic projector. Kuchitsu states that the principle of a kaleidoscope is used for the apparatus claimed (see last paragraph on page 6 of Kuchitsu translation). The applicant also states in the specification that the principle of a kaleidoscope is used for the claimed apparatus (see paragraph [0010], line 1 of applicant's U.S. Patent Application Publication US 2006/0146560 A1). Therefore it is abundantly clear that both Kuchitsu's apparatus and the apparatus claimed in the instant application work using a common principle, i.e. the principle of a kaleidoscope.

24. Furthermore, prior art Twyman (U.S. Patent 1,577,388) teaches of such a kaleidoscopic projector (see lines 9-10, left column, page 1).



25. Claims 1-6, 9, 14-18, 20-23 and 25-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuchitsu (JP 62007019 A).

26. **Claim 1** is rejected because:

27. Kuchitsu teaches of an apparatus (**see Fig.1**) comprising; a light source **3, 6** (see Figures 1 and 2) arranged to illuminate part of the input face of a light guide **1a**, the light guide **1a** comprising a tube having substantially reflective sides (see last paragraph on page 8 of Kuchitsu translation); and, projection optics **4** (see first paragraph on page 8) arranged together with said light source **3, 6** and said light guide **1a** so as to project a symmetrical pattern (**see Fig.3**) of the light source **3, 6** towards the scene **5** (see bottom paragraph on page 7) to generate structured light for illuminating a scene **5**, in an apparatus for generating structured light for illuminating a scene.

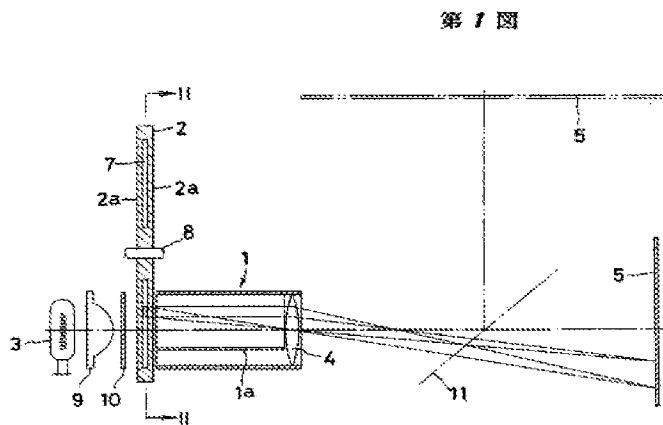


Figure 1. Structured light generating apparatus (JP 62007019 A)

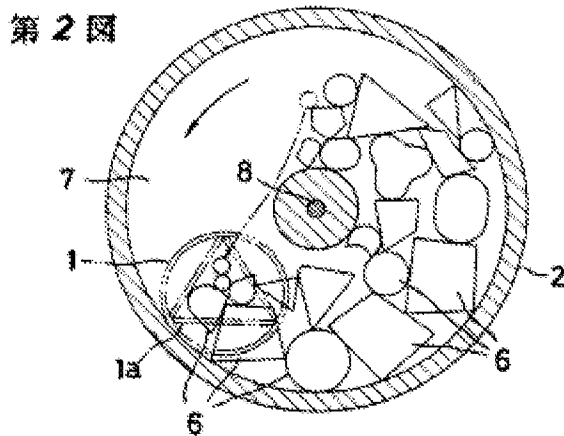


Figure 2. Structured light generating apparatus (JP 62007019 A)

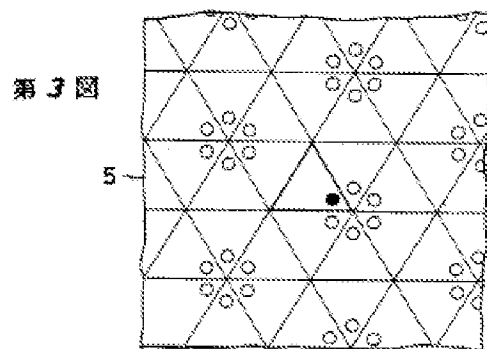


Figure 3. Array of distinct images (JP 62007019 A)

- A. However, Kuchitsu does not explicitly teach of projecting a regular array of spots of the light source towards a scene in a structured light generator for illuminating a scene.
- B. Kuchitsu teaches the use of light emitting diode (LED) as source of light (see second paragraph on page 9, and first paragraph on page 16 of Kuchitsu translation). LEDs are known in the art as point light sources. When an LED or a point light source is used as a light source on the input side of the lightguide, it projects a plurality of distinct areas of light towards a scene. This is the principle of a kaleidoscope which is known in prior art.

C. In view of Kuchitsu's teaching of LED or point light source(s) placed on the input side of the lightguide, it is obvious to a person having ordinary skill in the art (PHOSITA) at the time the invention was made that when LEDs are used as light source it would project a regular array of spots of the light source towards a scene, and this structured light generator may be used for illuminating a scene with regular array of spots so that the spots may be used for entertainment or for providing range or size information by measuring distance between spots.

D. The recitation "such that light reflected from the scene can be imaged to provide range information" has not been given patentable weight because the recitation occurs in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). See MPEP 707.07 (f).

28. **Claim 2** is rejected for the same reasons of rejection of claim 1 as above and because Kuchitsu discloses that the light guide is formed as a kaleidoscope in a **cylindrical** body **1** (see first paragraph on page 8 and Figure 1). Webster's II Dictionary defines cylinder as "the part of such a surface bounded by two parallel planes and the regions of the plane bounded by the surface." It is obvious to a PHOSITA that surface bounded by parallel planes have a constant cross-section. Therefore it is clear that Kuchitsu's tubular light guide has a constant cross-section.

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29. **Claim 3** is rejected for the same reasons of rejections of claims 1 and 2 as above and because Kuchitsu teaches that the cross-section of the tube is a regular polygon (see last sentence on page 8 and Figure 1).

30. **Claim 4** is rejected for the same reasons of rejection of claim 1 as above and because in view of Kuchitsu teaching that the mirror surfaces can be increased and that it can be made into a polyhedron (see last paragraph on page 8), it would have been obvious to a PHOSITA that tube may have a square or any other desired cross-section in an apparatus for generating structured light for illuminating a scene.

31. **Claim 5** is rejected for the same reasons of rejection of claims 1 and 4 as above and because in view of Kuchitsu teaching that the mirror surfaces can be increased and that it can be made into a polyhedron (see last paragraph on page 8), it would have been obvious to a PHOSITA to select a tube of any desired shape or size or cross-sectional area to obtain a desired result in an apparatus for generating structured light for illuminating a scene. Furthermore, it would take only ordinary engineering expedience to select a specific cross-sectional area to obtain a desired result.

32. **Claim 6** is rejected for the same reasons of rejection of claim 1 as above and because Kuchitsu teaches that the light guide comprises a hollow tube with three reflecting mirror surfaces **1a** and arranged as a kaleidoscope to form the light guide (see last paragraph of page 8 and Figure 1) in an apparatus for generating structured light for illuminating a scene.

33. **Claim 9** is rejected for the same reasons of rejection of claim 1 as above and because Kuchitsu teaches that the projection optics comprises a projection lens **4** (see third paragraph on page 12 and Figure 1) in an apparatus for generating structured light for illuminating a scene.

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34. **Claims 14 and 15** are rejected because Kuchitsu teaches of a projection optics/lens to project the light exiting the lightguide and it obvious to a PHOSITA that a lens provides focused image at its focal length, the first distance, and by default provides unfocused image at any point outside of its focal length the second distance, in an apparatus for generating structured light for illuminating a scene.

35. **Claim 16** is rejected for the same reasons of rejection of claim 1 as above and because Kuchitsu teaches that the light source has a non-circular shape. It is evident from Figure 4 that the colored transparent small chips **6** which in combination with lamp **3** effectively forms a source of light to illuminate part of the input face of the light guide **1a** have non-circular shape (see second paragraph on page 9 of Kuchitsu translation and Figure 4) in an apparatus for generating structured light for illuminating a scene.

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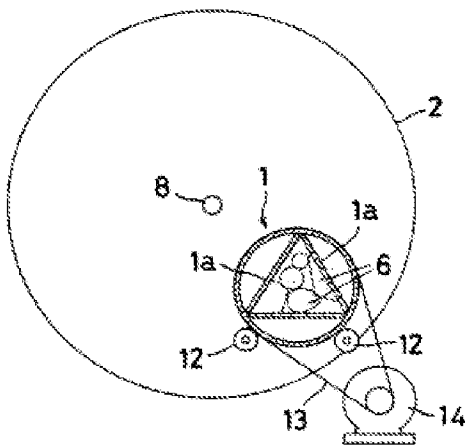


Figure 4. Structured light generating apparatus (JP 62007019 A)

36. **Claim 17** is rejected for the same reasons of rejection of claim 16 as above and because Kuchitsu teaches that the light source has a non-circular shape that is not symmetric about the

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axes of reflection of the light guide. It is evident from Figure 4 that the colored transparent small chips **6** which in combination with lamp **3** effectively forms a source of light to illuminate part of the input face of the light guide **1a** have non-circular shape and not symmetric about the axes of reflection of the light guide (see second paragraph on page 9 of Kuchitsu translation and Figure 4) in an apparatus for generating structured light for illuminating a scene.

37. **Claim 18** is rejected for the same reasons of rejection of claim 1 as above and because Kuchitsu teaches of more than one light source, each light source arranged to illuminate part of the input face of the light guide. It is evident from Figure 4 that the colored transparent small chips **6** which in combination with lamp **3** effectively form a source of light to illuminate part of the input face of the light guide **1a** (see second paragraph on page 9 of Kuchitsu translation and Figure 4) in an apparatus for generating structured light for illuminating a scene.

38. **Claim 20** is rejected because kaleidoscope principles teach that in a **kaleidoscopic projector**, when a light source or an illuminated object or an image or a pattern is placed or positioned at the input face of the light guide having reflective sides, it results in the projection of a symmetrical pattern toward a scene, wherein the shape and size of the projected pattern has a direct correspondence to the shape and size of the light source or illuminated object that is placed or positioned at the input face of the light guide. In view of the above, it is obvious to a

PHOSITA that having different arrangements at the input face of the light guide would result in differing spot densities, in an apparatus for generating structured light for illuminating a scene.

39. **Claim 21** is rejected for the same reasons of rejection of claim 18 as above and because Kuchitsu teaches of at least one light source emits light at a different wavelength to another light source (see second paragraph on page 9 of Kuchitsu translation), in an apparatus for generating structured light for illuminating a scene.

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40. **Claim 22** is rejected for the same reasons of rejection of claim 18 as above and because Kuchitsu teaches of at least one light source is shaped differently from another light source. It is evident from Figure 4 that each of the colored transparent small chips **6** *having different shapes* which in combination with lamp **3** effectively forms a source of light to illuminate part of the input face of the light guide **1a** (see second paragraph on page 9 of Kuchitsu translation and Figure 4) in an apparatus for generating structured light for illuminating a scene.

41. **Claim 23** is rejected for the same reasons of rejection of claim 18 as above and because Kuchitsu teaches that at least one light source has a shape that is not symmetric about a reflection axis of the light guide. It is evident from Figure 4 that each of the colored transparent small chips **6** which in combination with lamp **3** effectively forms a source of light to illuminate part of the input face of the light guide **1a** (see second paragraph on page 9 of Kuchitsu translation and Figure 4) and is not symmetric about a reflection axis of the light guide, in an apparatus for generating structured light for illuminating a scene.

42. **Claims 25-33** are rejected because they are directed to placing or positioning various light source arrangements or light source shapes or patterns or designs to project structured light having different patterns or shapes or spot size or spot densities toward a scene. Kaleidoscope principles teach that in a **kaleidoscopic projector**, when a light source or an illuminated object or an image or a pattern is placed or positioned at the input face of the light guide having reflective sides, it results in the projection of a symmetrical pattern toward a scene, wherein the shape and size of the projected pattern has a direct correspondence to the shape and size of the light source or illuminated object that is placed or positioned at the input face of the light guide. Paragraph 24 above also explains Kuchitsu's related teachings on **kaleidoscopic projector**.

Claim 25 claims a light source arranged to run from one side of the input face to another to provide one type of pattern on the input face of the light guide;

Claim 26 claims a different light source arrangement to provide yet another type of pattern on the input face of the light guide;

Claim 27 claims a different light source arrangement to provide yet another type of pattern on the input face of the light guide;

Claim 28 claims a light source illuminating the input face of the light guide through a mask to provide yet another type of pattern on the input face of the light guide;

Claims 29-33 claim a light source illuminating the input face of the light guide through different type(s) mask(s) to provide other type(s) of pattern(s) on the input face of the light guide;

Providing different light patterns on the input face of the light guide is what Kuchitsu does (see first paragraph on page 8, the second paragraph on page 9 and the last paragraph on page 11 of Kuchitsu translation).

In view of the above, it would have been obvious to a PHOSITA that having different arrangements at the input face of the light guide would result in differing light patterns having different size, shape or densities, in an apparatus for generating structured light for illuminating a scene. Furthermore, Kuchitsu teaches of using different types light sources (see second paragraph on page 9 of Kuchitsu translation) for projecting a structured light having different sizes and shapes, in an apparatus for generating structured light for illuminating a scene.

43. Claim 34 is rejected for the same reasons of rejection of claim 28 as above and because, given the broadest interpretation, Kuchitsu's apparatus comprises a mask 2 and a modulator 14 (which is the motor) adapted such that the transmission characteristics of the mask 2 is varied (by rotating the mask), in an apparatus for generating structured light for illuminating a scene.

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44. Claims 7, 8, 19 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuchitsu (JP 62007019 A) in view of Yokoyama (U.S. Patent 7,131,735 B2).

45. **Claim 7** is rejected because:

- A. Kuchitsu teaches all claim limitations except that the light guide comprises a tube of solid material in an apparatus for generating structured light for illuminating a scene.
- B. Yokoyama teaches of an apparatus comprising a light guide comprising a tube of solid material (see col. 3, lines 1-10) in an apparatus for generating structured light for illuminating a scene.
- C. In view of Yokoyama's teaching, it would have been obvious to a PHOSITA at the time the invention was made to substitute Kuchitsu's hollow tube light guide with a solid light guide due to the fact that a solid light guide is more durable, reliable, easier to manufacture and therefore more cost efficient for use in an apparatus for generating structured light for illuminating a scene.

46. **Claim 8** is rejected because:

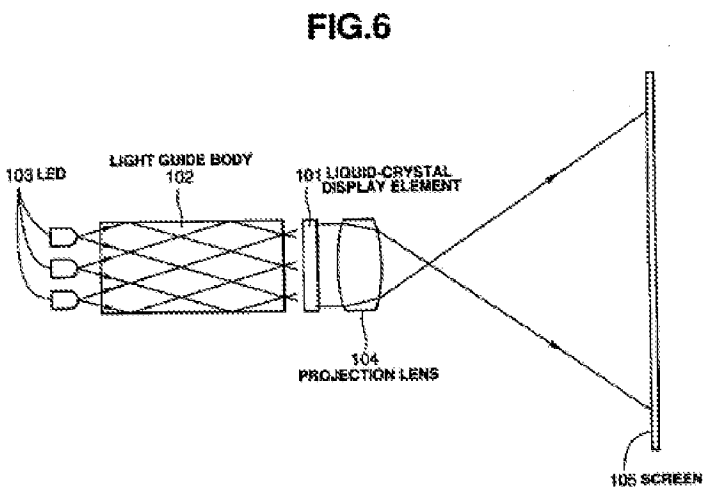
- A. Kuchitsu teaches all claim limitations except that the length of the light guide is between 10 and 70 mm long, in an apparatus for generating structured light for illuminating a scene.
- B. Yokoyama teaches of an apparatus comprising a light guide, wherein the length of the light guide may be adjusted in the direction of the optical axis (see col. 3, lines 61-64) in an apparatus for generating structured light for illuminating a scene.
- C. In view of Yokoyama's teaching, it would have been obvious to a PHOSITA at the time the invention was made to incorporate Yokoyama's teaching of having a desired length

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for the light guide into Kuchitsu's apparatus for the purpose of having a more uniform light output in an apparatus for generating structured light for illuminating a scene.

47. **Claim 19** is rejected because:

- A. Kuchitsu teaches all claim limitations except that the light sources are arranged in a regular pattern, in an apparatus for generating structured light for illuminating a scene.
- B. Yokoyama teaches of arranging the light sources in a regular pattern (see Figures 6 and 9) in an apparatus for generating structured light for illuminating a scene.
- C. In view of Yokoyama's teaching, it would have been obvious to a PHOSITA at the time the invention was made to incorporate Yokoyama's teaching of arranging the light sources in a regular pattern into Kuchitsu's apparatus for the purpose of having a more uniform light output in the apparatus for generating structured light for illuminating a scene.

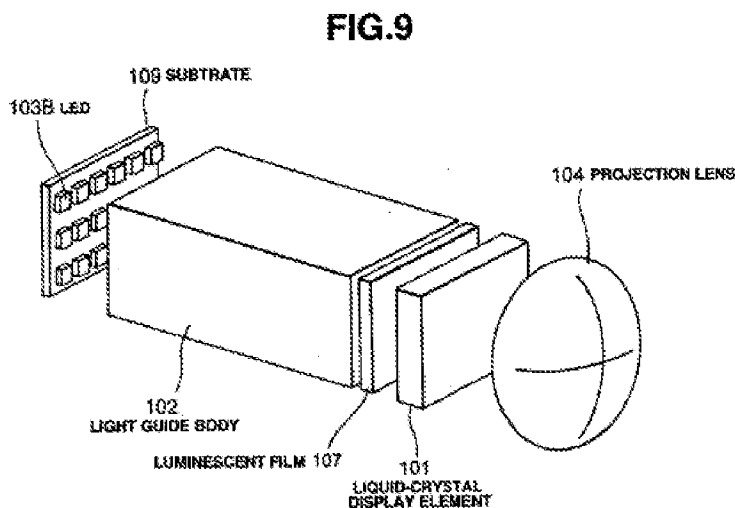


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48. **Claim 36** is rejected for the same reasons of rejection of claim 8 above with regard to selecting the length of the light guide, and because by selecting an appropriate or desired light guide length will result in a desired projection angle. Therefore it would have been obvious to a PHOSITA that a projection angle of 50 to 100 degrees can be obtained by selecting appropriate length of the light guide as taught by Yokoyama (see col. 3, lines 61-64) in an apparatus for generating structured light for illuminating a scene so that by limiting the projection angle a light pattern with a more uniformly intensity can be projected onto a screen/scene.

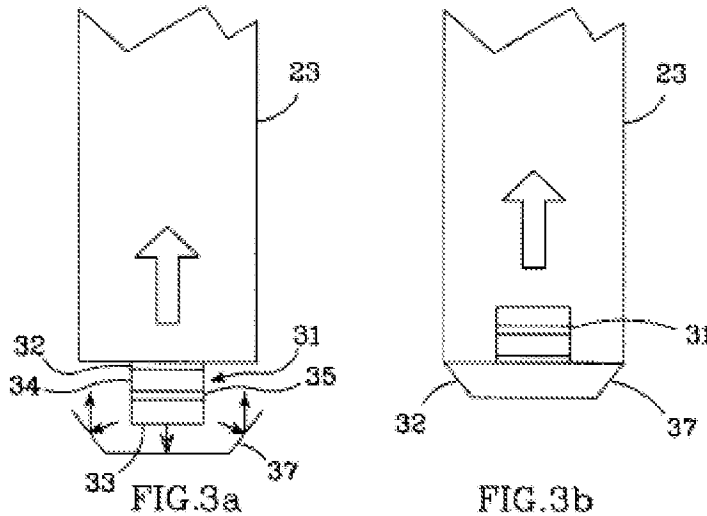
49. **Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuchitsu (JP 62007019 A) in view of Tarsa et al (U.S. Patent 6,350,041 B1).**

50. **Claim 24** is rejected because:

- A. Kuchitsu teach all claim limitations except that at least one light source is located within the light guide, at a different depth to another light source in a structured light generator for projecting an array of distinct images of light source towards a scene for displaying complex patterns of light on the scene for various purposes.

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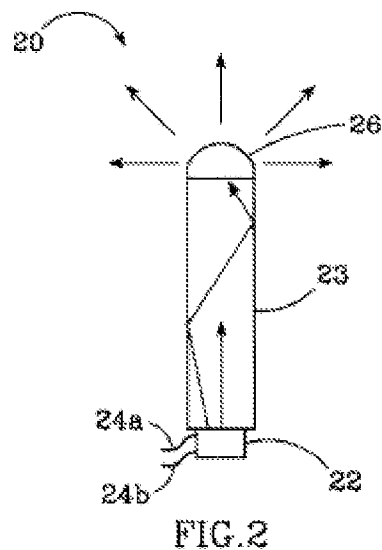
- B. Tarsa et al (Tarsa hereinafter) teaches of various locations at which light source(s) 31 may be placed/arranged (see col.5, line 34 - col.6, line 47; Figures 3a-3d), and specifically at least one light source 31 located within the light guide (see Figure 3b), in a structured light generator for projecting patterns of light (see col.3, lines 17-18) towards a scene.
- C. In view of Tarsa's teaching of having at least one light source located within the light guide and various other arrangements, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate any of the particular placement/arrangement of light source(s) as shown by Tarsa in Figures 3a-3d, *or a combination thereof*, to have one light source located within the light guide at a different depth to another light source, into Kuchitsu's apparatus due to the fact that it would provide an increased number of complex projection patterns in a structured light generator for projecting an array of distinct images/patterns of light source towards a scene for displaying complex patterns of light on the scene for various purposes.



51. Claims 10-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuchitsu (JP 62007019 A) in view of Yokoyama (U.S. Patent 7,131,735 B2) and further in view of Tarsa et al (U.S. Patent 6,350,041 B1).

52. Claim 10 is rejected because:

- A. Kuchitsu and Yokoyama teach all claim limitations except that the tube of solid material is shaped at the output face to form a projection lens in a structured light generator for projecting images of light source towards a screen/scene.
- B. Tarsa et al (Tarsa hereinafter) teaches of an apparatus comprising a solid tube/light guide having an output face 26 to form a projection lens (see col.5, lines 13-27 – specifically lines 24-27, and Figure 2) in a structured light generator for projecting patterns of light (see col.3, lines 17-18) towards a scene.



U. S. Patent 6,350,041 B1

C. In view of Tarsa's teaching of having an output face of a light guide to form a projection lens, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate such a structure into Kuchitsu's and Yokoyama's teachings, specifically into Yokoyama's teaching, for having the output face of the light guide to form a projection lens due to the fact that such a combined/consolidated part would eliminate any lens versus tube alignment problems and provide cost savings due to having a single part in a structured light generator for projecting an array of distinct images of light source towards a scene/screen for displaying complex patterns of light on the scene/screen for various purposes in an apparatus for generating structured light for illuminating a scene.

53. **Claim 11** is rejected because Tarsa teaches of a hemispherical projection lens 26 (see col.5, lines 13-27 – specifically lines 24-27, and Figures 2) at the output face of a light guide in a structured light generator for projecting patterns of light (see col.3, lines 17-18) towards a scene. In view of Tarsa's teaching of having a hemispherical projection lens at the output face of a light

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guide, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate such a hemispherical projection lens into Kuchitsu's and Yokoyama's teachings, specifically into Kuchitsu's teaching, due to the fact that a hemispherical projection lens would provide a wider angle of projection for projecting larger size images in a structured light generator for projecting an array of distinct images of light source towards a scene/screen for displaying complex patterns of light on the scene/screen for various purposes in an apparatus for generating structured light for illuminating a scene.

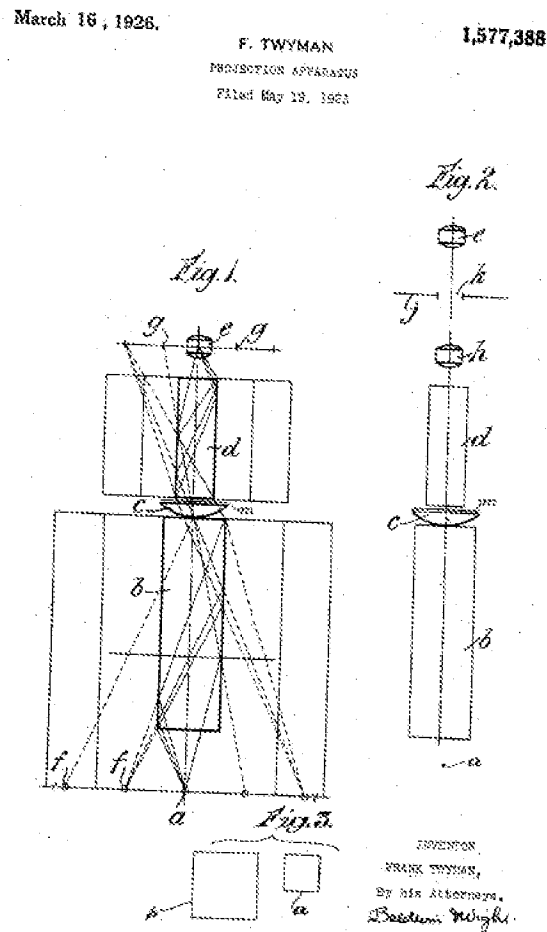
54. **Claim 12** is rejected because Tarsa teaches that centre of the hemispherical lens is located at the centre of the output face of the light guide (see Figures 2, 5a, 5b, 5e). In view of Tarsa's teaching of having a hemispherical projection lens located at the centre of the output face of the light guide, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate such a hemispherical projection lens at the centre of the output face of the light guide into Kuchitsu's and Yokoyama's teachings, specifically into Kuchitsu's teaching, due to the fact that a hemispherical projection lens at the centre of the output face of the light guide would provide a symmetrical pattern projected onto a scene with a structured light generator for projecting distinct images or patterns of light source towards a scene/screen for displaying complex patterns of light on the scene/screen for various purposes in an apparatus for generating structured light for illuminating a scene.

55. **Claim 13** is rejected for the same reasons of rejection of claim 12 and because it is obvious to a PHOSITA at the time the invention was made that when a hemispherical projection lens located at the centre of the output face of the light guide, as claimed in claim 12, an image or pattern projected towards the scene would have a common point of origin because placing or positioning the hemispherical projection lens at the centre of the output face of the light guide

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would result in less light leakage and there more efficient light output in an apparatus for generating structured light for illuminating a scene.

56. Claims 35 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuchitsu (JP 62007019 A) in view of Twyman (U.S. Patent 1,577,388).



57. Claim 35 is rejected for the same reasons of rejection of claim 28 as above and because:

- A. Kuchitsu teaches all claim limitations except for a homogenizer disposed between the light source and the mask in an apparatus for generating structured light for illuminating a scene.

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B. Twyman teaches of a homogenizer **b** (see lines 25-29, left column, page 1 and Figure 1) disposed between the light source **a** and mask **m** for homogenizing or providing uniform illumination of the mask **m**, in an apparatus for generating structured light for illuminating a scene.

C. In view of Twyman's teaching, it would have been obvious to a PHOSITA at the time the invention was made to incorporate Twyman's teaching into Kuchitsu's apparatus due to the fact that uniformly intense light can be projected over an entire scene, in an apparatus for generating structured light for illuminating a scene.

58. **Claim 37** is rejected because Twyman teaches that the smaller cross-section light guide **d** (compared to a larger cross-section light guide **b**) is used for projecting a structured light onto a screen/scene (see page 3, right column), wherein the smaller cross-section of light guide **d** results in a larger depth of field. Therefore it would have been obvious to a PHOSITA to select an appropriate or desired cross-sectional area for a light guide to have a desired dept of field in an apparatus for generating structured light for illuminating a scene so that a focused image can be projected onto a screen over a wider range with an increased depth of field.

59. **Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over view of Twyman (U.S. Patent 1,577,388).**

60. Claim 1 is rejected because:

A. Twyman teaches of an apparatus (**see Fig.1**) comprising; a light source **a** arranged to illuminate part of the input face of a light guide **d**, the light guide **d** comprising a tube having substantially reflective sides (see page 1, lines 34-38); and, projection optics **e** (see Figure 1) arranged together with said light source **a** and said light guide **d** so as to

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project a (symmetrical) pattern (**see page 1, lines 25-29**) of the light source **a** towards the scene (see page 2, lines 66-68) to generate structured light for illuminating a scene.

- B. However, Twyman does not explicitly teach of projecting a regular array of spots of the light source towards a scene in a structured light generator for illuminating a scene.
- C. Twyman teaches the use of other sources of light (see page 1, line 39).
- D. In view of Twyman's teaching of any other light source(s) placed on the input side of the light guide, it would have been obvious to a person having ordinary skill in the art (PHOSITA) at the time the invention was made to incorporate small lamps as light source due to the fact that it would project a regular array of spots of the light source towards a scene, and this structured light generator may be used for illuminating a scene with regular array of spots so that the spots may be used for entertainment or for providing range or size information by measuring distance between spots.

61. As can be seen from the Twyman patent, Twyman teaches several claimed features, and it would have been obvious to a PHOSITA at the time the invention was made to combine such features with other prior art cited in PTO-892.

Remark

62. It is noted that in claim 36, projection of "images" is claimed, which the applicant replaced with "spots" in its parent claim, claim 1.

Conclusion

63. The final rejection of the previous office action has been withdrawn.
64. All of the applicant's arguments presented in pages 13-23 of the papers filed on 06/16/2009 have been addressed as detailed in paragraphs 3-15 above.
65. Claims 1-37 have been rejected based on prior art and there is no reliance on "official notice."
66. The prior art cited in the accompanying PTO-892 is made of record and not relied upon, are considered pertinent to applicant's disclosure.

Contact/Status Information

67. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Roy M. Punnoose** whose telephone number is **(571)272-2427**. The examiner can normally be reached on 9:30 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Tarifur R. Chowdhury** can be reached on **571-272-2287**. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy M. Punnoose/
Primary Examiner
Art Unit 2886

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PAT-NO: JP362007019A
DOCUMENT-IDENTIFIER:
TITLE: DISPLAY DEVICE
PUBN-DATE: January 14, 1987

INVENTOR-INFORMATION:

NAME **COUNTRY**
KUCHITSU, TAKUYO

APPL-NO: JP60145780
APPL-DATE: July 4, 1985

INT-CL (IPC): G02B027/08 , G09F009/30

US-CL-CURRENT: 359/FOR.100

ABSTRACT:

PURPOSE: To express an extremely complex pattern by forming colored transparent small chips or the like, forming many virtual images through a cylindrical mirror surface body obtained by combining several reflecting mirror surfaces and expanding the images to project them on a screen.

CONSTITUTION: Subjects 6 such as colored transparent sheet-like small chips are inserted into a space part 7 of a moving body 2 so as to be freely rotated. A light source 3 and the cylindrical mirror surface body 1 obtained by combining three reflecting mirror surfaces 1a are arranged on both the sides of the moving body 2. When the moving body 2 is rotated and light is irradiated from the light source 3, many virtual images of the subjects 6 are formed by the reflection of light in the cylindrical body 1 like a kaleidoscope and projected on the screen 5 through an expanding lens 4. Consequently, extremely complex patterns can be automatically and continuously displayed and can be used for various purposes.

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